Knowledge, attitude and practice of dentists towards prescribing chlorhexidine mouthwash in satara district, Maharashtra

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Abstract

Objective: The main objective of the study is to establish dentist's knowledge about Chlorhexidine (CHX) mouthwashes and their short-term as well as long-term side effects, their attitude towards the use of mouthwashes and their use in various treatment modalities.

Methods: A pre-tested validated questionnaire of 15 multiple choice questions was circulated as a google form amongst dentists in Satara district. A total of 258 dentists participated in the study. The first section contained questions on respondent's socio demographic characteristics. The second section contained questions regarding knowledge, attitude, and practice of chlorhexidine mouthwash. The filled questionnaire was analysed by using SPSS 20.0 software.

Results: Different concentrations of CHX mouthwash were prescribed routinely only by 13.4% of respondents. A total of 74.6% dentists positively believed that CHX mouthwash reduces bacterial and viral load in COVID-19 affected patients. About 40.3% believe that the persistent use of CHX mouthwash causes anti-microbial resistance.

Conclusions: The present study shows an overall adequate knowledge and awareness on chlorhexidine prescription and its use amongst dentists. Certain aspects like different concentrations of mouthwash, anti-discoloration systems, long term prescription of CHX elicited varied responses from the subjects. Therefore, there is a

need for constant enhancement of knowledge regarding the usage of CHX to keep the dentists updated and implement the same in their clinical practice.

Keywords: Antimicrobial, Antiplaque, Chlorhexidine, COVID, Dentist.

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Introduction

Dental plaque is the major etiological factor associated with the initiation of gingivitis and periodontitis. [1] The two main mechanisms of plaque removal and control are mechanical and chemical. The Mechanical methods includes toothbrushing and interdental cleaning aids. The chemical method involves the use of mouthwashes containing antibiotic agents, quaternary ammonium compounds, phenols, herbal extracts, and flavouring agents. Mechanical plaque control effectively removes dental plaque and resolves the gingival inflammation. Antimicrobial mouth rinses as an adjunct to daily plaque control has proven to be more beneficial than teeth brushing alone. [2, 3]

Mouthwashes are chemical formulations that are helpful in the patients with debilitating diseases and systemic conditions that hampers oral hygiene maintenance. Chlorhexidine (CHX) is a gluconate salt with the chemical formula (1,1'- hexamethylene bi [5-(p-chlorophenyl) biguanide] di-D-gluconate). It is a broad- spectrum anti-microbial agent which causes disruption of cellular membranes thus reducing the plaque accumulation. CHX is considered as the gold standard in prevention of plaque formation and gingival inflammation due to its antiplaque and anti-gingivitis effects. [4, 5, 6, 7, 8] CHX being an over-the-counter drug comes with a set of side-effects including staining of teeth, altered taste perception and many more. Hence, the Knowledge of prescription practice regarding chlorhexidine mouth rinse is inevitably important for general dentists to imply a successful treatment outcome. Study amongst the dentist will help in knowing the trends regarding CHX mouthwash prescription. Therefore, the knowledge associated with prescription of chlorhexidine has been surveyed in the form of questionnaire among the general dentists in Satara district, Maharashtra.

Subjects and Methods:

Questionnaire Development:

Questionnaire was fabricated after referring a range of systematic reviews and literature reviews presenting the variety of aspects of CHX. Expert opinion from senior periodontists were considered to develop and validate the questionnaire. The pretested questionnaire was analysed based on the results obtained from pilot study for its reliability.

Study Design:

The ethical clearance was obtained from the Institutional Ethical Committee (IEC) of KIMSDU, Karad (Ref. No. KIMSDU/IEC/06/2022) prior for commencing the study. The information and email addresses of the dentist were gathered from the regional Indian Dental Association (IDA). The study questionnaire was sent to the dentists by email as a google form link to the questionnaire. The participant information sheet was provided, and informed consent was obtained from each practitioner before enrolling them in the study. Google form consisting of 15 open-ended questions was the means for acquiring data from the dentists who were willing to participate in the study. The survey was conducted from July 1- August 1, 2022.

Data Collection:

The questionnaire in English language consisted of three parts knowledge, awareness, and practices. The first section contained questions on the respondent's socio demographic characteristics such as age, gender, qualification with specialty and years of clinical experience. The second section contained 15 questions regarding knowledge, attitude, and practice of chlorhexidine mouth mouthwash.

Statistical Analysis

Data entries were made in Microsoft Office Excel 2010 and analyses of results was done using Statistical product and service solution (SPSS) version 21 software. Descriptive statistics such as mean and standard deviation were calculated for quantitative variables. Percentage/ proportions were used to represent qualitative data. The p value was fixed at 0.05. Data normality was checked using Shapiro Wilk test. Chi square test was used to compare qualitative parameters between three groups.

Results:

A total of 258 dentists participated in the study and were segregated based on their qualifications. In which 68 (25.4%) were BDS- General dentists, 69 (25.7%) were PG- Postgraduate residents and 131(48.9%) were MDS- specialists.

Table 1: Responses of dental practitioners to the questions.

Questions		BDSn (%)	PG n (%)	MDSn (%)	Chi square test value	p value
1.When do you advise your patients to usea CHX	Before Brushing	0 0%	0 0%	16 12.2%		
	Immediately	20	12	36		

mouthwash?	after brushing	29.4%	17.4%	27.5%		
	30 minutes after brushing	28 41.2%	53 76.8%	75 57.3%		
	Anytime	20 29.4%	4 5.8%	4 5.8%	**Chi = 58.335**	**p=<0.001 ****
2.How long do you advise yourpatients to use a chlorhexidine mouthwash?	1-2 weeks	40 58.8%	37 53.6%	59 45 %		
	3 weeks	20 29.4%	16 23.2%	60 45.8%	**Chi =23.42**	**p =0.001***
	6-7 weeks	8 11.8%	12 17.4%	12 9.2%		
		0	4	0		
	12 weeks	0%	5.8%	0%		
3.How long do you advise yourpatients to swish the chlorhexidine mouthwash?	Spit immediately	0 0%	0 0%	8 3.1%		
	30 seconds	28 41.2%	48 69.6%	88 67.2%		
	1 minute	32 47.1%	21 30.4%	35 26.7%	**Chi =27.7**	**p < 0.001****
	2 minutes	8 11.8%	0 0%	4 3.1%		
4.Do you prescribe different concentrationsof CHX mouthwash fordifferent patients?	Always	4 5.9%	8 11.6%	24 18.3%		
	Sometimes	48 70.6%	21 30.4%	75 57.3%	**Chi =34.1**	**p <0.001****
	Never	16 23.5%	40 58%	32 24.4%		
5.The side effects of chlorhexidine mouthwash include	Parotiditis	0 0%	4 5.8%	4 3.1%		
	Erosion of oral mucosa	4 5.9%	4 5.8%	8 6.1%		
					Chi =26.0	**p <0.001****
	Discoloration of teeth	28 41.2%	4 5.8%	36 27.5%		
	All of above	36	57	83		

		52.9%	82.6%	63.4%		
6.What shouldbe the concentration and dose of chlorhexidine mouthwash?	0.2%,10 ml solution (Without dilution)	32 47.1%	33 47.8%	59 45%		
	0.2%,20 ml solution (Without dilution)	12 17.6%	0 0%	12 9.2%		
	0.2%,20 ml solution diluted in10 ml of water	16 23.5%	24 34.8%	36 27.5%	**Chi = 14.8**	**p =0.022***
	0.2%,10ml solution diluted in 100 ml of water	8 11.8%	2 17.4%	4 18.3%		
7. Do you prescribe CHX	Always	0 0%	4 5.8%	12 9.2%		
mouthwash to the patients without performing oral prophylaxis?	Sometimes	28 41.2%	25 36.2%	51 38.9%		
	Occasionally	20 29.4%	20 29%	28 21.4%	**Chi = 8.17**	**p =0.226 (NS)**
	Never	20 29.4%	20 29%	40 30.5%		
8.What is the alternative mouthwash you prefer over chlorhexidine?	Povidone Iodine	28 41.2%	52 75 .4 %	88 67.2 %		
	Herbal mouthwash	28 41.2%	12 17.4%	12 9.2%	**Chi = 38.4**	**p <0.001****

	Fluoride Mouthwash	8 11.8%	4 5.8%	24 18.3%		
	Essential Oils	4 5.9%	1 1.4%	7 5.3%		

*p<0.05 – significant **p<0.001 – highly significant NS- not significant

Table 2: Responses of dental practitioners to the questions.

Questions	BDSn (%)	PG n (%)	MDSn (%)	Chi square test value	p value
9.Do you ask your patients to dilute themouth wash before using?	40 58.8%	44 63.8%	96 73.3%	**Chi =4.7**	**p =0.044***
10. Are you aware of any commercially available chlorhexidine mouthwash withan Anti-Discoloration System?	24 35.3%	21 30.4%	63 48.1%	**Chi =12.2**	**p =0.016***
11. Do you think the chlorhexidine mouthwash reduces the bacterial andviral load in the patients affected withCOVID-19?	48 70.6%	52 75.6%	100 76.8%	**Chi =5.18**	**p = 0.268 (NS)**
12. Do you use mouthwashes prior todental procedures amidst COVID pandemic?	47 69.5%	53 76.8%	115 88.2%	**Chi = 14.9**	**p =0.005***
13. Is it essential to prescribe chlorhexidine as a pre-proceduralmouthwash to prevent aerosol contamination?	56 82.4%	57 82.6%	107 81.7%	**Chi = 1.810**	**p =0.771 (NS)**
14. Can chlorhexidine gluconate oral rinse cause Permanent alteration in tasteperception?	4 5.9%	16 23.2%	24 18.3%	**Chi = 23.874**	**p<0.001****
15. Can persistant use of chlorhexidinemouthwash causes anti-microbial resistance?	24 35.3%	29 42%	55 42%	**Chi = 14.19**	**p = 0.007***

*p<0.05 – significant **p<0.001 – highly significant NS- not significant

A majority of 76.8% PG residents advised their patients to use CHX 30 minutes after brushing which is suggestive of higher level of knowledge than the other respondents.

Maximum percentage of general dentists (58.8%) advised the use of CHX for 1-2 weeks. The p value was statistically significant.

About 69.6% PG residents opinioned that the rinse time for CHX is 30 seconds for its effectivity as compared to general dentists and specialists which was statistically significant.

About 34.1% of respondents always prescribe same concentration of CHX for each patient which is highly significant.

Majority of dentists have an opinion that parotiditis, erosion of oral mucosa and tooth discoloration are the side effects of CHX usage with a p value highly significant p<0.001.

Majority of respondents amongst which the PG residents were found to be in maximum percentage to prescribe 0.2% of 10 ml CHX without dilution.

About 41.2% general dentists in majority prescribe CHX at times without performing oral prophylaxis and 31% dentists never prescribed CHX before oral prophylaxis.

A higher percentage (75.4%) PG residents followed by specialists and general dentists are aware about povidone iodine followed by herbal mouthwash as an alternative for CHX. The value of which is highly significant.

On comparison, a majority of 73.3% MDS practitioners had an opinion that CHX is to be diluted before use with a significant p value.

About 48.1% of MDS practitioners had a better awareness on commercially available CHX with Anti-discoloration

system as compared to other respondents.

Majority of MDS (76.8%) followed by the other practitioners believed that use of CHX mouthwash is effective in reducing the bacterial and viral load in Covid affected patients.

A total of 88.2% MDS dentists used CHX as a pre-procedural rinse during Covid pandemic as compared to others.

Most of PG residents (82.6%) think that use of CHX can prevent aerosol contamination if used prior to the dental procedures, the p value is not statistically significant.

A higher percentage (23.2%) PG residents had a wrong opinion that use of CHX can alter the taste perception in individuals permanently.

Only 42% of PG residents and MDS practitioners in the study were aware that use of CHX does not develop Anti-microbial resistance in hosts.

Discussion:

Mouthwash plays an important role in the treatment of gingivitis and periodontitis. About 60.4% of practitioners in our study recommended their patients to use CHX 30 minutes after brushing. The time interval between toothbrushing and rinsing with CHX should be more than 30 minutes, cautiously close to 2 hours after brushing [10]. A rinse time of 30 seconds appears to be effective and acceptable although 60-second rinse time is also advocated [11]. In our study, about 136 dentists recommended a rinse time of 30 seconds while according to a majority of BDS dentists 1 minute should be the rinsing time for CHX. Most of the studies evaluated 0.2% CHX mouthwash with a rinse volume of 10 ml twice a day is beneficial while some studies concluded 0.12% or 0.1% CHX with a rinse volume of 15 ml twice a day. A study reported that use of 0.12% chlorhexidine mouthwash provided the same clinical benefits as a 0.20% chlorhexidine a twice daily regimen.[12] Therefore, regardless of the concentration of chlorhexidine mouthwash used, the dose of chlorhexidine was effectively the same in most of the studies and corresponded to the optimal dose of 18 mg to 20 mg twice a day. It has been demonstrated that increasing the duration of rinsing with 0.12% or 0.2% chlorhexidine mouthwash from 30 to 60 seconds results in greater substantivity of the rinse [13]. CHX may confer some clinical benefits in managing gingivitis, 4-6 weeks of daily rinsing with 0.2% CHX reduces clinical signs. [14]

The mechanism of action of CHX involves bacterial cell destruction, bacterial enzyme inhibition and extraction of endotoxin from the bacteria Gram-negative species. They possess anti-inflammatory action and has prostaglandin synthetase inhibition activity. It acts as an antioxidant by scavenging the free oxygen radicals. CHX has an anti-microbial effect on bacteria, fungi and viruses which are causative agents for several different oral diseases. In vitro, the anti-bacterial effects of CHX relates to alteration of cell membrane permeability.[15] At low concentrations (0.02%-0.06%) CHX causes displacement of Ca2+and Mg2+ and loss of K+ from the cell wall, resulting in a bacteriostatic effect. At high concentrations (>0.1%) CHX causes leakage of intracellular components out of the cell, resulting in a cell lysis and death and in turns provides bactericidal effect. [15-16]

A study conducted by Costa et al (2021) concluded CHX 0.12% was effective in reduction of SARS COV-2 load in saliva.[30] Similarly, 78% dentists in our study believed the same. The anti-viral effects of CHX are due to altered cell membrane permeability and consecutively CHX can inactivate the enveloped viruses, such as herpes simplex virus, which are usually associated with cold sores. However, CHX has low virucidal activity on unenveloped viruses, including human papilloma viruses (HPV), which may be associated with oral cancers. [17,18] The anti-fungal effects of CHX are related to the inhibition of biofilm formation on both biological and non- biological surfaces, by species such as Candida, rather than disrupting the structure or cellular membrane of the microbe. Pre-surgical mouth rinse (0.12% or 0.2% CHX) is believed to reduce oral microbial load for 7-10 days prior to surgery and immediately prior to surgery. [19,20]

CHX as a mouthwash has adverse effects, one of the most common being dry mouth (xerostomia), altered taste sensations (hypogeusia) specifically towards salt and bitter, a discoloured or coated tongue. According to our study 56.7% practitioners believed that CHX cannot cause permanent alteration of taste perception. Despite anti-plaque properties of CHX, an increase in calculus formation has also been reported with 0.12% CHX mouthwash. [21] Other less common side effects include burning sensations (glossodynia), desquamation of the oral mucosa, swelling of the parotid gland and oral paraesthesia. [22] However, the most unacceptable outcome, that discourages the patients to use CHX mouthwash, is probably tooth staining. [23] Once the usage exceeds more than several weeks, the teeth tend to get stained due to non- enzymatic browning (Maillard reaction) and the production of pigmented metal sulphide in the pellicle. [24] This in turn may allow tin and iron binding reactions with dietary aldehydes and ketones which enhances food precipitation components onto the teeth. [25] Nevertheless, formulations of CHX are now available that prevents tooth staining by an additional anti-discoloration system (ADS) to reduce tooth surface staining via inhibition of the Maillard reaction and protein denaturation. A majority of the MDS practitioners in our study were aware about the commercially available CHX mouthwash with ADS than other respondents. The BDS dentists and PG dentists lacked knowledge regarding ADS mouthwash. Mouthwashes specifically Povidone - iodine is a potential anti-viral agent that can significantly reduce viral load in saliva and subsequently in aerosols thus limiting the spread COVID-19 infection. [26] According to Imran et al (2021)

about 80.6% dental practitioners had a knowledge that CHX was effective as a pre-procedural rinse amidst Covid. With accordance to this study, 65.1% dentists in our study had similar knowledge regarding effectivity of CHX.

Another emerging issue with CHX is Anti-microbial resistance (AMR), whereby the micro-organisms are designated to get killed but eventually becomes adapted and resistant, which reduces the efficacy of the mouthwash. [27] Several mechanisms which result in AMR includes mutation or addition of genetic material that led to increased expression of efflux pumps in cell membrane structure and promoting the cross- resistance of other bacteria to antibiotics amongst the most multi-drug resistant species. [28-30] However, there is no evidence in the current literature proving that CHX causes antimicrobial resistance in the patients. Only 54.2% practitioners in our study were aware that there is no such correlation regarding development of AMR due to persistent use of CHX mouthwash, while others lacked knowledge of it.

Limitations and recommendations:

A longitudinal study incorporating qualitative design with a large sample size is required to explore further correlations.

Conclusion

Based on the findings of our study, it is evident that dentists of all qualifications are aware about the uses of mouthwashes, but are reluctant about prescribing to their patients on regular basis because of their potential side effects. Modification in the formulation of mouthwashes with enhanced properties and proven alternatives to CHX are available in the market. Efforts should be taken to ensure such knowledge reaches to the practicing dentists to achieve a translational step towards a better clinical practice of mouthwash prescription.

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Conflicts of interest: - None

References

1. Löe H, Theilade E, Jensen SB. Experimental gingivitis in man. J Periodontol. 1965, 36: 177- 187.
2. Axelsson P, Lindhe J. Efficacy of mouthwashs in inhibiting dental plaque and gingivitis in man. J ClinPeriodontol. 1987, 14: 205-212.
3. Brecx M, Macdonald LL, Legary K, Cheang M, Forgay MG. Long-term effects of Meridol and chlorhexidine mouthwashs on plaque, gingivitis, staining, and bacterial vitality. J Dent Res. 1993, 72: 1194-1197.
4. Jones CG. Chlorhexidine: is it still the gold standard? Periodontol 2000. 1997, 15: 55-62.
5. Corbet EF. Therapeutic effects of supervised chlorhexidine mouthwashes on untreated gingivitis. Oral Dis. 1997, 3: 9-18.
6. Eaton KA, Rimini FM, Zak E, Brookman DJ, Hopkins LM, Cannell PJ et al. The effects of a 0.12% chlorhexidine digluconate-containing mouthwash versus a placebo on plaque and gingival inflammation over a 3-month period. A multicentre study carried out in general dental practices. J ClinPeriodontol. 1997, 24: 189-197.
7. Lang NP, Hase JC, Grassi M, Hämmerle CH, Weigel C, Kelty E, et al. Plaque formation and gingivitis after supervised mouthrinsing with 0.2% delmopinol hydrochloride, 0.2% chlorhexidinedigluconate and placebo for 6 months. Oral Dis. 1998, 4: 105-113
8. Zanatta FB, Antoniazzi RP, Rösing CK. Staining and calculus formation after 0.12% chlorhexidine rinses in plaque-free and plaque covered surfaces: a randomized trial. J Appl Oral Sci. 2010, 18: 515-521.
9. Das T, Ramesh A, Muralidharan NP. Comparison of antibacterial efficacy of three mouthwashes in chronic periodontitis patients-An in vitro study. Drug Invention Today. 2018;10(8).
10. Kolahi J, Soolari A. Rinsing with chlorhexidine gluconate solution after brushing and flossing teeth: A systematic review of effectiveness. Quintessence international (Berlin, Germany: 1985) 2006;37:605-12.
11. Keijser JAM, Verkade H, Timmerman MF, Weijden FA. Comparison of 2 commercially available chlorhexidine mouthwashs. Journal of Periodontology 2003;74(2):214-8.
12. Segreto, V.A., Collins, E.M., Beiswanger, B.B., Rosa, M., Isaacs, R.L., Lang, N.P et al (1986). A comparison of mouthrinses containing two concentrations of chlorhexidine. Journal of Periodontal Research, 21, 23-32.
13. Tomás I, Cousido MC, Garcia-Caballero L, Rubido S, Limeres J, Diz P. Substantivity of a single chlorhexidine mouthwash on salivary flora: Influence of intrinsic and extrinsic factors. Journal of Dentistry 2010;38(7):541-6.
14. Zhang Y, Zhao Y, Xu C, Zhang X, Li J, Dong G et al. Chlorhexidine exposure of clinical Klebsiella pneumoniae strains leads to acquired resistance to this disinfectant and to colistin. Int J Antimicrob Agents. 2019 Jun;53(6):864-867.
15. Gilbert P, Moore LE. Cationic antiseptics: diversity of action under a common epithet. J Appl Microbiol. 2005;99(4):703-15.
16. Cieplik F, Jakubovics NS, Buchalla W, Maisch T, Hellwig E, Al-Ahmad A. Resistance Toward Chlorhexidine in Oral Bacteria - Is There Cause for Concern? Front Microbiol. 2019 Mar 22; 10:587.
17. McDonnell G, Russell AD. Antiseptics and disinfectants: activity, action, and resistance. Clin Microbiol Rev. 1999 Jan;12(1):147-79.
18. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. J Hosp Infect. 2020 Mar;104(3):246-251.
19. Veksler AE, Kayrouz GA, Newman MG. Reduction of salivary bacteria by pre- procedural rinses with chlorhexidine 0.12%. J Periodontol. 1991 Nov;62(11):649-51.
20. Bryce G, Bomfim DI, Bassi GS. Pre- and post-operative management of dental implant placement. Part 2: management of early-presenting complications. Br Dent J. 2014 Aug;217(4):171-6.
21. Zanatta FB, Antoniazzi RP, Rösing CK. Staining and calculus formation after 0.12% chlorhexidine rinses in plaque-free and plaque covered surfaces: a randomized trial. J Appl Oral Sci. 2010 Sep-Oct;18(5):515-21.
22. Tartaglia GM, Tadakamadla SK, Connelly ST, Sforza C, Martín C. Adverse events associated with home use of mouthrinses: a systematic review. Ther Adv Drug Saf. 2019 Sep 23; 10:2042098619854881.
23. Van Strydonck DA, Slot DE, Van der Velden U, Van der Weijden F. Effect of a chlorhexidine mouthrinse on plaque, gingival inflammation and staining in gingivitis patients: a systematic review. J Clin Periodontol. 2012 Nov;39(11):1042-55.
24. Addy M, Moran J. Mechanisms of Stain Formation on Teeth, in Particular Associated with Metal Ions and Antiseptics. Advances in Dental Research. 1995;9(4):450-456.
25. Eriksen HM, Nordbø H, Kantanen H, Ellingsen JE. Chemical

plaque control and extrinsic tooth discoloration. A review of possible mechanisms. J Clin Periodontol. 1985 May;12(5):345-50.
26. Imran E, Khurshid Z, Adanir N, Ashi H, Almarzouki N, Baeshen HA. Dental Practitioners' Knowledge, Attitude and Practices for Mouthwash Use Amidst the COVID-19 Pandemic. Risk Manag Healthc Policy. 2021 Feb 15;14:605-618.
27. Kampf G. Acquired resistance to chlorhexidine - is it time to establish an 'antiseptic stewardship' initiative? J Hosp Infect. 2016 Nov;94(3):213-227.
28. Cieplik F, Jakubovics NS, Buchalla W, Maisch T, Hellwig E, Al-Ahmad A. Resistance Toward Chlorhexidine in Oral Bacteria - Is There Cause for Concern? Front Microbiol. 2019 Mar 22; 10:587.
29. Wood A, Payne D. The action of three antiseptics/disinfectants against enveloped and non-enveloped viruses. J Hosp Infect. 1998 Apr;38(4):283-95.
30. Costa DD, Brites C, Vaz SN, de Santana DS, Dos Santos JN, Cury PR. Chlorhexidine mouthwash reduces the salivary viral load of SARS-CoV-2: A randomized clinical trial. Oral Dis. 2021 Nov 26.